

# Organic Matter Accumulation of Bentgrass Cultivars Following Establishment on a Sand-Based Putting Green

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Photo by Doug Karcher

Organic matter accumulation of creeping bentgrass in a sand-based rootzone during the first year of growth.

**Summary.** Managing organic matter near the surface in sand-based putting greens is a concern for many golf course superintendents. Newer cultivars of creeping bentgrass have improved density over older cultivars and may accumulate organic matter more rapidly. The objective of this study was to determine the organic matter content for 29 cultivars of one-year-old bentgrass that were established on a sand-based putting green. Four-inch diameter samples were extracted for each cultivar and the surface 0.5 inch of the rootzone

sectioned for organic matter analysis. At one year following establishment, there were significant differences in organic matter content among the cultivars. Newer and experimental cultivars had higher organic matter content than older cultivars such as L-93, SR 1020, and Crenshaw. Golf course superintendents should closely monitor organic matter accumulation and select appropriate management practices for putting greens established with newer, denser cultivars.

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Excessive organic matter accumulation can be a problem on sand-based, creeping bentgrass (*Agrostis stolonifera*) putting greens, especially during prolonged periods of high temperatures and humidity. The accumulation of organic matter, which is formed by roots, stems, nodes, leaf sheaths, and other tissues, decreases the saturated hydraulic conductivity and atmospheric gas exchange near the rootzone surface as the putting green matures and can increase moisture content near the surface. This may manifest as summer stress decline during periods of high temperature and humidity, especially if the turf is predisposed from other stresses, such as excessively low mowing heights. In the quest for higher green speeds, the selection of creeping bentgrass cultivars with high density and fine leaf texture has become one way superintendents are attempting to achieve the highest possible green speed, since these cultivars tolerate lower mowing heights than older cultivars. Though the new cultivars have been shown to have high shoot density and good uniformity, they may produce more organic matter near the rootzone surface, which may be contributing to summer stress or localized dry spot. Since the more dense cultivars are relatively new releases, there is little known about the amount of organic matter they produce. Therefore, the objective of this research was to determine the amount of organic matter accumulated over time by various creeping bentgrass cultivars.

### Materials and Methods

This experiment was conducted in October 2009 at the University of Arkansas Research and Extension Center in Fayetteville on a pre-existing cultivar trial, the 2008 NTEP Bentgrass Putting Green Trial. The trial was established on 30 September 2008 on a sand-based rootzone constructed according to United States Golf Association specifications. Nineteen cultivars were officially included in the 2008 NTEP Bentgrass Putting Green Trial and an additional eleven cultivars were included at the Arkansas site (Crystal Bluelinks, CY-2, MacKenzie, Crenshaw, Penn A-4, Penn G-1, Penn G-2, Penn G-6, Shark, SR 1020, and Tyee) due to either their common use

in this region or superior performance in a previous cultivar trial (Summerford et al., 2009). One cultivar in the trial, SR 7200, which is a velvet bentgrass (*Agrostis canina*), was not included in this experiment due to very poor turf coverage following the summer of 2009. Each cultivar was broadcast seeded into four replicate, 6 by 6 ft plots at a seeding rate of 1 lb/1000 ft<sup>2</sup>. Following establishment, the trial was maintained under golf course putting green conditions (Table 1), with a mowing height of 0.125 inch and monthly nitrogen applications of 0.5 lb N/1000 ft<sup>2</sup> per month of active growth.

The experimental design was a randomized complete block design with 29 cultivars replicated 3 times for a total of 87 plots. One core sample was taken from each plot using a standard size cup cutter at a depth of 3.5 inches. Verdure was removed and the samples were cut to a thickness of 0.5 inch to include all surface organic matter. Samples were then placed into numbered, pre-weighed crucibles and moved into a drying oven and allowed to dry at 100 °C for 24 h and then weighed. Samples were then placed into a muffle furnace at 440 °C to ash for 8 h, to combust the organic matter in the sample, and then weighed again. The percent organic matter was calculated for each sample by dividing its decrease in weight during combustion (organic matter lost by ignition) by its weight after drying at 100 °C.

### Results and Discussion

There were significant differences among cultivars with regard to their organic matter accumulation (Fig. 1). There were eight cultivars, MVS-AP-101, Shark, A09-TDN2, CY-2, PST-OJO, V8, Authority and Penn A-2, that had more organic matter than the three cultivars with the least organic matter, L-93, SR 1020 and Crenshaw. Those cultivars accumulating the most organic matter were mostly newer cultivars (except Penn-G2) or experimental cultivars with improved density compared to older cultivars such as Penncross, L-93, SR 1020, and Crenshaw. Although not directly measured in this experiment, the denser cultivars likely produce more shoots, roots, stems, nodes, and leaf sheaths per unit area

than less dense cultivars. These data provide some initial evidence that there are differences among creeping bentgrass cultivars in their organic matter accumulations rates. Furthermore, cultivars with high shoot densities seem to accumulate organic matter faster than the less dense cultivars. Therefore, when newer, denser cultivars of creeping bentgrass are used in sand-based putting greens, organic matter accumulation should be carefully monitored and appropriate core aeration and sand topdressing practices implemented to ensure adequate atmospheric gas exchange. It

is important to note that these data represent a single sampling date from relatively immature turf (approximately one year old). These cultivars will continue to be monitored for organic matter accumulation over the next several years.

### Literature Cited

Summerford, J., D. Karcher, M. Richardson, and A. Patton 2009. Summary of the 2008 NTEP bentgrass putting green trial-establishment. Arkansas Turfgrass Report 2008, Ark. Ag. Exp. Stn. Res. Ser. 568:132-136.

**Table 1. Maintenance of the experimental area.**

Maintenance practice	Description
Mowing	Six times per week at a 0.125 inch mowing height.
Fertility	0.5, 0.1, and 0.5 lb of N, K <sub>2</sub> O, and P <sub>2</sub> O <sub>5</sub> , respectively, per 1000 ft <sup>2</sup> per month of active growth. Other nutrients applied according to soil test recommendations.
Irrigation	Approximately every 3 days, or as needed to prevent drought stress.
Growth regulation	Primo Maxx (trinexapac-ethyl) applied at 1/8 oz. per 1000 ft <sup>2</sup> per month of active growth.
Wetting agent application	Revolution applied at 6oz per 1000ft <sup>2</sup> per month from May through September.
Cultivation	The experimental area had not been core aerified prior to organic matter evaluations.
Sand topdressing	Sand topdressing applied every 14 days throughout the growing season at an approximate rate of 4 ft <sup>3</sup> sand per 1000 ft <sup>2</sup> .
Pesticides	Applied only on a curative basis.

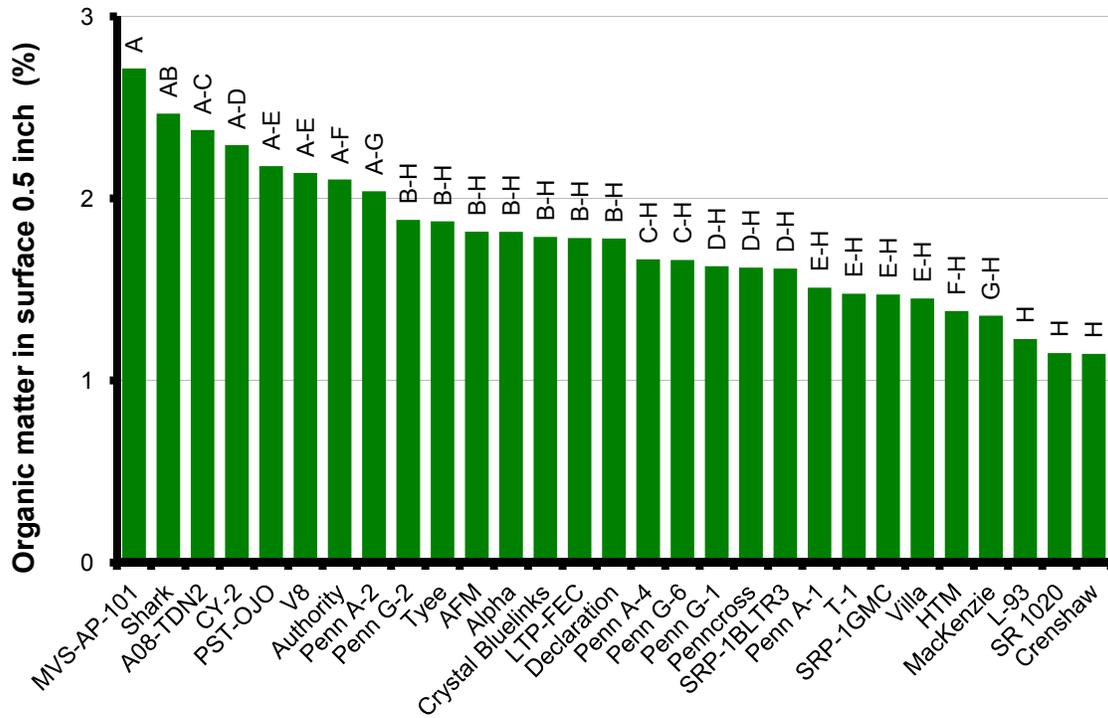


Fig. 1. Organic matter accumulation in the surface 0.5 inch of a sand-based putting green rootzone at approximately one year following establishment. Cultivars that do not share a letter are significantly different ( $\alpha = 0.05$ ).